ABSTRACT:

We report an application of composite cavity fiber laser (CCFL) for hydrophone sensitivity enhancement. While most of the sensitivity enhancement methods rely on amplification of acoustic signal by the coating design, our proposed scheme exploits the inherently nonlinear phase condition of the CCFL. A particular point of interest for CCFL hydrophone application is the proposed partial cavity sensing scheme that, when only one cavity is made responsive, a substantial sensitivity enhancement can be achieved. Theoretical analysis shows that this scheme can significantly enhance sensitivity, achieving as high as 40 dB excess to the standard response of a bare fiber. In experiment, this scheme produced a mean responsivity of -41.1 dB re rad Pa-1, representing an improvement in sensitivity by 14 dB compared to the standard response. Evidently, this CCFL sensing scheme provides an additional means for sensitivity improvement in conjunction to the conventional packaging technique.